Western Snowy Plovers and California Least Terns on Rancho Guadalupe Dunes Preserve, Guadalupe CA 2014 Final Report

Prepared for:

The County of Santa Barbara
Santa Barbara, California
and
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This report summarizes 2014 breeding season monitoring of western snowy plovers and California least terns on Rancho Guadalupe Dunes Preserve, a Santa Barbara County Park. The Park is owned and operated by the County of Santa Barbara. Monitoring was conducted by Melissa Kelly (Assistant Naturalist/Ranger II, Recovery Permit # TE-54710A-0).

Abstract

Snowy plovers were monitored between March 29 and August 7, 2014. Sixty field surveys were conducted. Sixty-eight snowy plover nests and no least tern nests were discovered. The first known snowy plover nest was initiated on approximately 26 March and the last on 7 July. The fates of 63 nests were determined: 31 hatched at least one chick, 23 were lost to predators, 6 were abandoned, 0 nests were lost to surf wash, 3 nests buried by high winds, and there were 5 nests for which the fate could not be determined since all evidence was erased by wind. The first known hatch occurred on approximately 27 April and the last on 7 August. At least 77 chicks hatched from the 31 successful nests. The earliest expected fledge date for 2014 chicks was 25 May and the last fledging was expected to occur about 7 August. Least terns were not seen nor heard on the Preserve or in the Santa Maria River this year.

Introduction

Western snowy plovers (*Charadrius nivosus nivosus*) (Cassin. 1858) inhabit coastal sand beaches along the Washington, Oregon, California, and Mexico coastlines, and suitable inland habitat at alkaline lakes, ponds and river bars in the western states (Page et.al., 1995). The U.S. Fish and Wildlife Service designated the Pacific Coast population as "Threatened" on March 5, 1993. The designated breeding season begins on March 1 and ends on September 30 annually. Nest initiations can begin in early March, but typically the first nests are not initiated until mid to late March, and occasionally early April. The last nests are initiated by mid-July, and hatch by mid-August, with the chicks fledging by mid-September. Snowy plovers are present year round at RGDP, with wintering populations ranging from 78-115 birds.

California least terns (*Sterna antillarum brownii*) utilize suitable breeding habitat from Baja California, Mexico to the San Francisco Bay area in California. Terns nest in colonies on open sand, sand-shell beaches, and sand-fill sites where little to no vegetation exists. Breeding colonies are typically located within close proximity to estuaries or waterways where birds forage for small fish. Least terns tolerate a considerable range in colony sizes. Some colonies have hundreds of birds, while some pairs nest alone or with only a few other pairs. The species was given both state and federal endangered status in 1970. In 1973, the population of the species neared 600 pairs, but had risen to an estimated 6437 to 6699 pairs in 2010 (Marschalek, 2010) and dropped to an estimated 4353-5561 pairs in 2013 (Frost. 2014). Least terns are typically present on RGDP from late May through August, and are absent the remainder of the year. However, during the 2014 nesting season no least terns were seen or heard.

Nesting snowy plovers (snowy plover, plover) and least terns (least tern, tern) were monitored on RGDP in 2001, and from 2003 through 2013. Monitoring did not occur in 2002. Prior to 2001 some non-intensive intermittent monitoring occurred, but no comparable data resulted from those efforts. This report compares data collected since 2001 when available and applicable (Applegate et. al.

2003, 2004, 2007, 2008, 2009, 2010, 2011, 2012, SRS 2006, Sandoval 2005, Persons 2001), with 2014 breeding season data. The RGDP boundaries were not surveyed and marked until 2003, so some nests recorded in 2001 may not have been on RGDP property.

Study Area

Rancho Guadalupe Dunes Preserve (RGDP) is located in northern Santa Barbara County (County), California, and encompasses approximately 592 acres, primarily immediately south of the Santa Maria River, but also a spit the continues north of the current river mouth. The majority of the property within RGDP is suitable breeding habitat for snowy plovers and least terns. RGDP borders the Pacific Ocean for approximately 1.3 miles and extends inland up to 1.4 miles.

Strong westerly and northwesterly winds of 25 to 35 miles per hour are common in spring and early summer, but generally decrease as the season progresses. The breeding habitat is composed of windswept open sand beaches, fore-dune and back-dune zones, manmade gravel flats, sections of old asphalt road and oil pad, coastal dune scrub and a riparian corridor with seasonal mudflats. Beaches are littered with logs, small plant debris, kelp, rocks and shells of varying sizes, and minimal human litter. The fore-dune habitat is made up of open sand with low sparsely vegetated humps and small dunes bordering the surf zone. Open sand expanses lead from the fore-dune area through the mid-dune and into the back-dunes. The mid-dunes are sparsely vegetated, and the back-dune area varies from open sand expanses to more densely vegetated dunes and scrub-covered areas.

Suitable plover and tern breeding habitat extends north of RGDP through the Guadalupe Restoration Project (a Chevron property formerly known as UNOCAL and as Guadalupe Oil Fields), Guadalupe-Nipomo Dunes National Wildlife Refuge, Oso Flaco State Park and Oceano Dunes State Vehicular Recreation Area. To the south, contiguous breeding habitat exists on Gordon Sand and Leroy Trust properties (Corralitos Ranch).

The habitat has changed little since our first monitoring season in 2003. The dominant native plant species are beach bur (*Ambrosia chamissonis*), sand verbena (*Abronia latifolia*, *A. maritima*), beach saltbrush (*Atriplex leucophylla*), and beach morning glory (*Calystegia soldanella*). Dominant non-native species are sea rocket (*Cakile maritima*), iceplant (*Carpobrotus edulis and C. chilensis*) in the foredunes, and perennial veldt grass (Erharta calycina) and Bermudagrass (Cynodon dactylon) in the backdunes. European beachgrass (*Ammophila arenaria*), a problematic invasive found on neighboring breeding sites, was present in a relatively small area in the foredunes just south of the parking lot; this was eradicated in the early years of the Preserve and so far remains absent.

Methods

Snowy Plovers

Snowy plover monitoring was conducted in all suitable breeding habitat between March 2 and August 30, 2014. Melissa Kelly was the snowy plover monitor on site from March 1 through September 30. Thomas Applegate remained on call in case Least Terns arrived, but they did not. All surveys were conducted on foot. To avoid high afternoon winds, most surveys were completed in the morning. Later in the season when high winds became less frequent, some afternoon surveys were conducted.

An attempt was made to locate all snowy plover nests. The definition of a nest includes scrapes containing 1 or more eggs, or empty scrapes with convincing evidence that one or more eggs had been present. Empty scrapes without evidence of eggs or chicks, and single "dumped" eggs were not counted as nests. Nests were consecutively numbered and all pertinent information including attendant adults present, location, and number of eggs was recorded. Regular subsequent visits to each known nest were made, and the status of nests was recorded. Nests were not physically marked: their locations were recorded using a Global Positioning System (GPS) and existing landmarks.

Nest fates were determined by evidence at the nest sites. Those that disappeared before the expected hatch date were examined for the probable cause of loss. Empty nests near or past their expected hatch date were checked for chicks in the vicinity of the nest, displaying adults, eggshell pips in the nest, a flattened nest area, or for evidence of predators or other causes of loss. Hatching dates were estimated by known or estimated egg laying dates, and were projected 28 days after clutch initiation (Warriner et.al., 1986). Eggs were not floated and chicks were not banded.

Discussions at the fall 2013 RU-5 meeting concerning adult plover deaths in exclosures thought to be the result of predator harassment prompted a plan to hold exclosures in reserve, using them only if Common Ravens were observed regularly. As the season progressed, Ravens were not seen on the Preserve and the majority of nests were successful. The last week of May eggs began disappearing but no Raven tracks accompanied the predation. In early July Raven tracks began to accompany some predations, but most nests were left unpredated. In both 2012 and 2013 adult plover deaths occurred, one with the body found in the exclosure, and the other with the body found directly beside the exclosure. The exclosures consisted of a 36 inch cube made of no-climb wire fencing, open on the bottom and secured over the nests with 4 foot T-posts or fiberglass rods. Mini nest exclosures were not installed on nests during 2014 and no adult deaths occurred.

A snowy plover census was conducted on May 21 as part of a coordinated range-wide survey. This yearly census is coordinated by the U.S. Fish and Wildlife Service and is scheduled to occur during the period when the population is expected to be stable and consist primarily of breeding plovers. During this census, plover age, sex, location, and the number and size of accompanying chicks were recorded. Each plover was checked for color-bands.

California Least Terns

Least terns were anticipated and sought after expectantly but none were seen nor heard throughout the nesting season.

Results

Snowy Plovers

Population

The number of nesting snowy plovers on RGDP was estimated bi-weekly from active nest data. The estimate includes only nesting plovers and not breeding plovers that were rearing broods or in the

process of nest initiation. An accurate number of brood rearing plovers is not possible without chick banding. A peak number of 12 nesting plovers were present in late April (Table 1).

Table 1. The estimated number of nesting pairs bi-weekly during the 2014 breeding season.

March		April		May		June		July		August	
Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late
0	3	8	12	7	7	10	10	4	0	0	0

Yearly censuses were conducted in late May on RGDP between 2001 and 2014, excluding 2002 (Figure 1). The number of plovers observed on the censuses is not considered the total number using RGDP at the time because plovers are not easily detected due to expansive topography, and plovers may leave the site temporarily and often during the survey. The 2014 plover population census was conducted on Tues 22 May by Melissa Kelly with the help of Russell Walker who walked the beach in tandem as I walked inland. Twenty-seven adults, and six chicks were seen on RGDP. Four of the adults were males, one was female, and eleven were undetermined. All plovers were checked for color bands. Five banded adults seen were:

AR:BW	m
GG:RW	f looking
GG:RW	f
GN:RW	f looking
NR:GW	m

Four additional nests and six adults, none banded, were found on Mussel Rock Beach. No snowy plovers were seen at Paradise Beach.

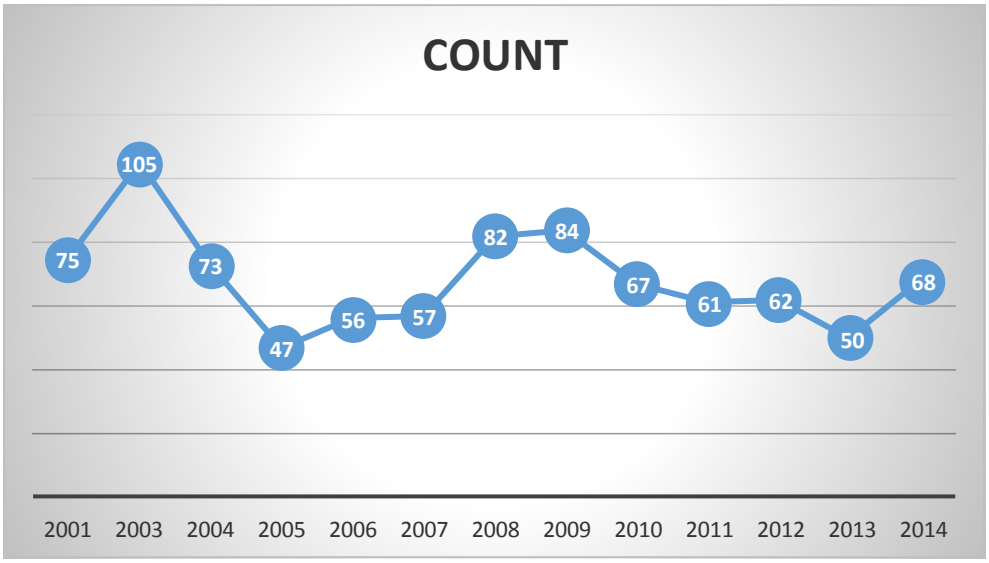
Figure 1. Snowy plovers counted during the range-wide census on RGDP 2001 - 2014.*

* No snowy plover monitoring was conducted in 2002.

Nesting and Productivity

Sixty-eight snowy plover nests were located on RGDP during the 2014 breeding season (Appendix 1). The actual number of nests was likely higher. It is probable that some nests were preyed on by ravens before they could be documented or were documented as predator unknown. The number of nests and their fates from 2001 through 2014 are compared in Figure 2 and Table 2.

Figure 2. Snowy plover nests on RGDP from 2001 - 2014.*



* No snowy plover monitoring was conducted in 2002.

The fates of 63 of the 68 nests were determined. Thirty-one nests hatched at least 1 chick, 23 were lost to predators, 6 were abandoned, 3 nests were buried by wind, 0 were lost to surf wash, and the fate of 5 nests was unknown since the wind destroyed any evidence.

The completion status of 52 of the 68 nests was established. Of the completed nests, 1 held 2 eggs and 51 held 3 eggs (155 eggs). This results in a mean clutch size of 2.98 eggs per clutch. The mean clutch size for each year (data is not available for 2001, 2005, and 2006) is as follows:

2014 – 2.98 eggs
2013 – 2.90 eggs
2012 – 2.89 eggs
2011 – 2.93 eggs
2010 – 2.88 eggs
2009 – 2.94 eggs
2008 – 2.93 eggs
2007 – 2.96 eggs
2004 – 2.90 eggs
2003 – 2.99 eggs

Of the 16 nests where completion status was not determined:

2-Egg Nests	**1-Egg Nests**
2 nests buried by the wind = 4 eggs	6 nests predated = 6 eggs
4 nests predated = 8 eggs	4 nest abandoned = 4 eggs
1 nest was abandoned = 2 eggs	

This brought the total number of known eggs produced on RGDP in 2014 to 155 + 24 = 169. An unknown number of nests were probably predated by ravens or an unknown predator before eggs were found, but wind erased any evidence of predation.

Table 2. Number and percent of snowy plover nests and their fates from 2001 through 2014.*

Year	Hatch	Dest. Pred.	Dest. Unk.	Unk. Fate	Aband.	Dest. Surf	Dest. Wind	Dest. Cattle	Dest. River	Dest. Human	Total Nests
2014	31 (46%)	23 (34%)	0	5(7%)	6 (9%)	0	3 (4%)	0	0	0	68
2013	21 (42%)	11 (22%)	0	10 (20%)	8 (16%)	0	0	0	0	0	50
2012	20 (32%)	27 (43%)	2 (3%)	1 (2%)	11 (18%)	1 (2%)	0	0	0		62
2011	29 (47%)	20 (33%)	1 (2%)	1 (2%)	10 (16%)	0	0	0	0	0	61
2010	34 (51%)	24 (36%)	4 (6%)	1 (1)%	3 (5%)	0	0	0	0	1 (1%)	67
2009	39 (46%)	27 (32%)	5 (6%)	5 (6%)	8 (10%)	0	0	0	0	0	84
2008	33 (40%)	26 (32%)	11 (14%)	6 (7%)	5 (6%)	0	1 (1%)	0	0	0	82
2007	27 (47%)	22 (39%)	1 (2%)	4 (7%)	3 (5%)	0	0	0	0	0	57
2006	32 (57%)	16 (29%)	0	2 (3%)	5 (9%)	0	0	0	0	1 (2%)	56
2005	27 (57%)	8 (17%)	0	2 (4%)	10 (21%)	0	0	0	0	0	47
2004	23 (32%)	36 (49%)	2 (3%)	3 (4%)	4 (5%)	0	1 (1%)	0	4 (5%)	0	73
2003	14 (13%)	64 (61%)	10 (9%)	5 (5%)	5 (5%)	0	5 (5%)	2 (2%)	0	0	105
2001	25 (33%)	18 (24%)	25 (33%)	1 (1%)	4 (5%)	0	2 (3%)	0	0	0	75

Fate Codes

Hatch - hatched one or more eggs, Dest. Pred. - destroyed by predator, Dest.Unk. - destroyed, cause undetermined, Unk. Fate - unknown, disappeared without evidence of hatch or loss, Dest. Surf - destroyed by surf wash, Aband. - abandoned before hatch, Dest. Wind - destroyed by wind, Dest. Cattle - destroyed by cattle, Dest. Flooding - destroyed by river flooding, Dest. Human - destroyed by human activity.

* No snowy plover monitoring was conducted in 2002.

Estimated or actual initiation dates were determined for all 68 nests. The estimated number of nest initiations monthly is compiled in Table 3, and compared with years this data was available.

Table 3. Nest initiations by month in 2003 - 2014.*

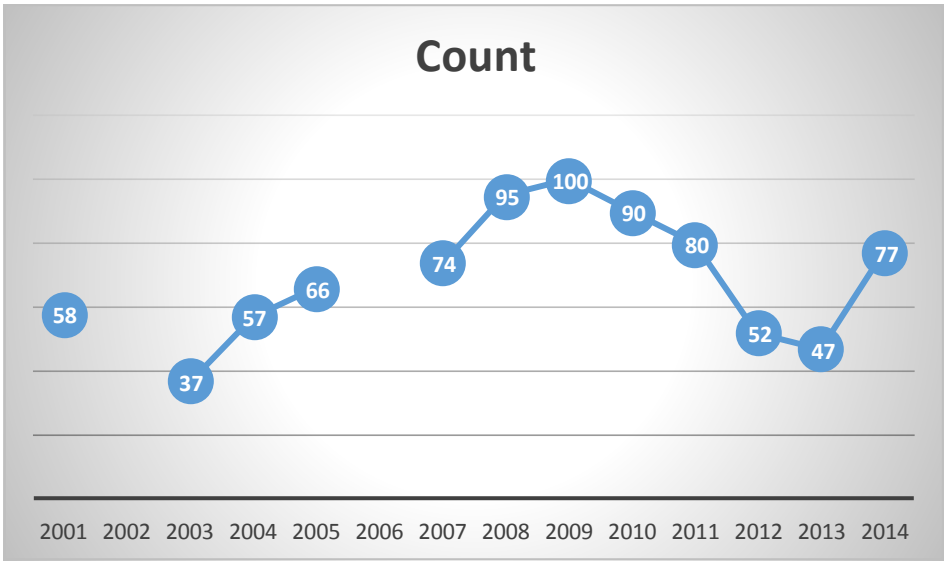
Month	**Number of Nests**									
	2003	**2004**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
March	7	0	0	4	4	1	3	0	0	3
April	15	20	17	11	24	10	22	20	7	23
May	23	21	18	23	15	23	14	13	13	15
June	33	21	13	19	31	23	15	20	23	19
July	11	6	8	22	10	10	7	9	7	7
Aug	0	0	0	0	0	0	0	0	0	1
Total	89	68	56	79	84	67	61	62	50	68

* Data not available for 2001, 2002, 2005, and 2006. Nests with estimated or known initiation dates only.

At least 77 chicks hatched from the 31 successful nests. Sixteen of the nests hatched 3 chicks, 14

nests hatched 2 chicks, and 1nests hatched 1 chick. The number of chicks hatched from 2001 through 2013 - excluding 2006 - is compiled in Figure 3.

Figure 3. Number of chicks hatched 2001 - 2014.*



*Data not available for 2002, or reported in 2006.
** At least 100 and possibly as high as 104 chicks hatched in 2009.

A total of 887 nests have been documented on RGDP over the past 13 (no monitoring 2002) monitored breeding seasons (Table 4). Of these, 355 have hatched at least 1 chick, resulting in an overall hatch rate of 40%. The depredation rate for this period was 36%; 8% percent destroyed by unknown causes, 9 % abandoned, 1% lost to wind, 0.5% lost to river flooding, 0.3% destroyed by cattle, 0.3% destroyed by human activities and 0.1% destroyed by surf wash. Fates of 4% of the total nests were undetermined.

Table 4. Combined number of snowy plover nests and their fates from 2001 - 2014.*

Years	Hatch	Dest. Pred.	Dest. Unk.	Aband	Dest. Wind	Dest. River	Dest. Cattle	Dest. Human	Dest. Surf	Unk. Fate	Total Nests
2001-2014	**355**	**320**	61	74	12	4	2	2	1	**40**	**887**
Percent	40%	36%	7%	8%	1%	0.2%	0.2%	0.2%	0.1%	4.5%	

* No snowy plover monitoring was conducted in 2002.

Brood Movement and Fledging

Because of the large size of the Preserve and the caution of the parents, broods are difficult to track. A few broods were in evidence however. Both new and older chicks were observed on at least 10-12 occasions during the breeding season. It is likely the ravens preying on nests were also preying on chicks. In addition to ravens; northern harrier, coyotes, raccoons, red-tailed hawks, great horned

owls and gulls were present and may have accounted for some chick loss. Broods were observed, in the nest area shortly after hatching, near the beach north and south of the parking lot, in the mid-dunes south of the parking lot and north near the estuary, in the back dunes near the Gordon Sand Plant, and south of Preserve boundary closer to Mussel Rock.
The earliest expected 2014 fledge date was approximately 25 May and the last was expected to occur about 4 September. Unbanded and banded fledglings were first observed in small numbers in early June. Fledglings were most often sighted north and south of the beach parking lot with small flocks of adult plovers.

Predators

Predators destroyed at least 23 (36.5%) of the 63 nests of known fate this season (Table 5). Common raven (*Corvus corax*) was the predominant observed and documented predator species. Ravens destroyed 7 nests (11 %). Coyotes destroyed 1 nest (2.5%). Great Horned Owls (*Bubo virginianus*) destroyed 2 nests. Twelve nests were lost to unknown predators. Three of these predations were on the sand spit north of the estuary mouth where predator and roosting bird tracks are too abundant to assign to any one cause of nest loss. Nine of the predations were south of the parking lot where, twice, northern harriers were seen hunting. Ravens are a constant threat; the first ravens being seen on 6 May and continued in the Preserve throughout May, June, and July. Ravens were also problematic in 2003, 2004, 2011, 2012 and 2013.

Coyote tracks were observed throughout breeding habitat on all surveys, and individuals were observed on a number of occasions. Track evidence showed that coyotes traveled the shoreline, back-dunes and river flats regularly.

Additional potential predators observed visually or by tracks this season were American kestrel (*Falco sparverius*), California gull (*Larus californicus*), Cooper's hawk (*Accipiter cooperii),* Great blue heron (*Ardea herodius*), Heermann's gull (*Larus heermanni*), Merlin falcon (*Falco columbarius*), Northern harrier *(Circus cyaneus),* peregrine falcon *(Falco peregrines*), raccoon (*Procyon lotor*), red-tailed hawk (*Buteo jamaicensis*), ring-billed gull (*Larus delawarensis*), and western gull (*Larus occidentalis*).

Table 5. Number of plover nests lost to predators on RGDP, 2001 - 2014.*

Species	Number Lost												
	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2001
Raven	7	8	19	11	1	0	0	6	0	0	20	16	0
Coyote	1	1	1	0	6	7	8	10	10	4	7	14	0
Gull	0	0	0	0	0	1	4	1	1	2	0	4	0
Crow	0	0	0	1	0	2	0	0	0	0	0	2	4
Unidentified Corvid**	0	0	0	0	2	0	0	0	0	0	0	0	0

Northern Harrier	?	0	0	0	1	0	0	0	0	0	0	0	0
Great Horned Owl	2												
Unk. Avian Predator	1	0	3	6	4	9	0	0	0	0	0	0	0
Unidentified Species	12	2	4	2	10	8	14	5	5	2	9	28	14
Total lost to Predators	23	11	27	20	24	27	26	22	16	8	36	64	18
Total number of nests*	63	40	61	60	66	79	76	53	54	47	70	100	74

* Known-fate nests only. ** Raven or crow.

Least Terns

Since 2001, least terns have nested on RGDP 7 of the 14 monitored breeding seasons. Nesting has occurred in the same general location: approximately 2500 to 3500 feet south of the parking area, and approximately 300 to 800 feet east of the shoreline. Monitoring did not occur in 2002, but Applegate visited the site and observed multiple nesting least terns and chicks in that area. In 2003, Applegate observed a roosting tern and a scrape in the area but no nest was known to be initiated. Terns did not nest on RGDP in 2003, 2006, 2008, 2011, 2012, 2013, or 2014.

Table 6. Least tern nests and their fates from 2001 through 2014.*

Year	Total Nests	Hatch	Dest. Predator	Predator	Pred Unk.	Dest. Unk.	Aband.	Unk. Fate
2001	12	8 (67%)	2 (17%)	coyote		1 (8%)	0	1 (8%)
2002	multiple	multiple	unk	unk	unk	unk	unk	unk
2003	0	0	0	0	0	0	0	0
2004	8	3 (37.5%)	1 (12.5%)	0	1	3 (37.5%)	1 (12.5%)	0
2005	4	0	1 (25%)	coyote	0	0	0	3 (75%)
2006	0	0	0	0	0	0	0	0
2007	1	1 (100%)	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0
2009	3	2 (67%)	1 (33%)		1	0	0	0
2010	1	1 (100%)	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0
2013	1 prob attempt	0	1 prob	Raven prob	0	0	unk	unk
2014	0	0	0	0	0	0	0	0

Fate Codes
Hatch - hatched one or more eggs, Dest. Predator - destroyed by predator, Dest.Unk. - destroyed, cause undetermined, Aband. - abandoned before hatch, Unk. Fate - unknown, disappeared without evidence of hatch or loss
* No least tern monitoring was conducted in 2002.

Table 7. Number of least tern nests, chicks, and fledglings in the 2001 through 2014 breeding seasons.*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Number of Nests	12	mult iple	0 nests 1scrape	8	4	0	1	0	3	1	0	0	unk	0	29
Number of Chicks	14	mult iple	0	7	0	0	1	0	3	2	0	0	0	0	27
Number Fledged	6 - 8	unk	0	unk	0	0	1	0	3	1	0	0	0	0	11 - 13

Numbers Observed Onsite		mult iple	1								2 adults flying north	Up to 20 at estuary	0	

No least tern activity was observed on RGDP or in the Santa Maria River estuary during the 2014 breeding season.

With the onset of drought the river mouth remained closed most of the 2013 breeding season, breaking open only 3 times: 6 March, 4 June, and 20 September. This is atypical and may have increased the density of prey fish for the terns, accounting for their presence and continued activity through the summer of 2013. In years with more normal rain the river mouth opens several times during a breeding season; for example it broke 9 times in 2012 when least terns were observed feeding in the estuary but did not nest. The river mouth broke only once in 2014 on 28 February but perhaps concentrations of agricultural runoff have become too high to support an adequate food supply. A collaborative study on water quality on the Central Coast in 2010 maintained that

> "The Santa Maria River estuary was the most impacted water body in this study" and that "the majority of water samples were highly toxic to invertebrates." … "Impacts in the Santa Maria River estuary were likely due to the proximity of this system to Orcutt Creek, the tributary which accounts for most of the flow to the lower Santa Maria River. Water and sediment samples from Orcutt Creek were highly toxic to invertebrates and toxicity was due to mixtures of the same pesticides measured in the estuary. Sand crabs and fish collected in and adjacent to the Santa Maria estuary were contaminated with numerous fungicides, herbicides, and pesticides."… "Sand crabs from the surf zone adjacent to the Santa Maria estuary mouth continue to be contaminated with high concentrations of DDT."… "Thirteen current-use pesticides as well as DDT and its two primary degradation products were detected in fish collected from the Santa Maria River estuary. The organophosphate pesticides chlorpyrifos and diazinon were detected in all fish from this estuary, as was the pyrethroid pesticide, bifenthrin. As was observed in sand crabs, several fungicides were also detected in fish tissue".

In 2003, when 3 least terns nested, terns were observed foraging and catching small fish immediately west of the colony on two occasions. This is approximately 3500-4000 ft south of the estuary mouth. They were also seen returning with fish from south of RGDP.

Human Activities affecting Plovers and Terns

Vehicle access to the beach parking lot at RGDP was open seven days a week all year except for 7 half days when the Park was closed to clear sand from the road and 7 days in December when the park flooded.

Visitor access and habitat closures remained the same as in previous years. Visitors were restricted to the access road, parking area, and the beach west of a symbolic fence line. The symbolic fence consisted of a single strand of yellow nylon rope stretched between posts. Habitat closure signs were mounted on approximately every fifth post. Signs, written in English and Spanish, informed visitors of seasonal restrictions. The fence ran a short distance above the mean high tide line along the beach from the north to the south boundary, and was moved east or west throughout the breeding season as

needed where beach sand accreted and eroded. The fence also lined both sides of the access road, the south boundary of RGDP, and all but the west side of the beach parking lot. The signs and rope remained in place from March 1 through September 30.

County staff maintained a presence on RGDP during open hours throughout the breeding season. One of their tasks was to monitor beach users and prevent them from entering the closed breeding habitat. Even with their presence, 26 incidents of trespassing occurred. Twenty-one of the trespass incidents occurred on the sand spit which borders the estuary. There is no signage in this area to prevent trespass, but staff attempts to inform visitors as they enter the beach heading north. Other trespassing occurred along the access road, and south of the parking lot.

There were no known incidents of human-caused loss of nests, chicks or adult plovers on RGDP in 2014.

Discussion

The 2014 distribution of nesting and flocking snowy plovers on RGDP was consistent with previous years. Fifty-six of the 68 nests (82%) were located within a 550 foot zone from the mid-dunes to the high tide line. Two nests were initiated near or directly beside the access road, and the remainder were scattered in the back-dunes. Fourteen of the nests were from 770 to 2200 ft from the high tide line.

Seasonal sand flats along the Santa Maria River were somewhat scoured during a Feb 28 storm, but apparently not enough to invite nesting and no nests were initiated in the River. None were found on the "Ten Commandments" site this year although there was a nest on the Chumash midden just west of the 1923 movie set.

The 2014 nest total increased by 18 nests over the 2013 breeding season, successful nests increased from 21 in 2013 to 31 in 2014, and there were perhaps 30 more chicks produced this year, nearly back up to 2011 numbers at 80 chicks; however it is likely that a number of hatched chicks were prey. Ravens again were a factor although depredation help from VAFB early in the season (Morgan Ball, pers. comm.) again helped immensely. Nest exclosures were not used in 2014, and the 2014 nest total on RGDP was likely higher than was documented.

Despite fairly heavy predation in snowy plover productivity in 2014 was better than 2012 and 2013 on RGDP. Several chicks were seen after hatching and some older chicks were observed during the breeding season. The absence of ravens during a critical hatching period in May seems to have made a big difference. Predators remain the leading cause of nest loss on RGDP. In 2005 Sandoval reported that nest abandonments (n=10) were higher than depredations (n=8), but in all other seasons predators have been the leading cause of nest loss. Over the last 11 monitored seasons, the mean percent lost to predators is 37%. In 2013 a reduction of 27.5% of nests destroyed by predators was undoubtedly due to depredation help from Oceano SVRA and VAFB. Ravens, always efficient at finding nests, undoubtedly found and destroyed some nests before they could be documented. An unknown predator was also very efficient. A depredation permit should be issued for RGDP by the start of the 2015 nesting season, and it is hoped that help from Wildlife Services might help us identify the unknown predator as well as reduce excessive predation.

Gulls have not been observed predating chicks or nests; northern harriers are seen most of the time hunting in the river hunt but were twice seen hunting the foredunes south of the parking lot; evidence of coyote predation was found at only one nest; tracks of Great Horned Owls are frequently seen in the dunes so it is somewhat surprising they were credited with only 2 nests. More often they are seen to feed on the Jerusalem Crickets which seem to be abundant throughout the Preserve.

Mini nest exclosures were not used in 2014. While exclosures are effective in reducing predation, other issues such as adult plover mortality (Persons et al. 2003) and nest abandonments (Hardy and Colwell, 2008) have been attributed to their use. In addition, coyotes are sometimes attracted to exclosures and either pull them up or undermine them as on RGDP in 2010 and 2012 (Applegate Pers. Obs). Six nest abandonments in 2014 without exclosure compared to 8 nest abandonments in 2013 with exclosures does not seem like much of difference, however there were no adult mortalities in 2014 while there was one in 2012 and one in 2013 with mini exclosures.

The plover and tern breeding habitat on RGDP is generally of high quality, but encroachment of ice plant threatens to degrade habitat. Spreading ice plant facilitates the unnatural growth of high dunes south of the parking lot, and large areas of iceplant are found on the north and south sides of the road just east of the beach parking lot. Park staff began removing ice plant, black mustard, Hottentot fig and other invasive plants by hand in 2011. Removal of these species from the Park should be considered a management priority. European beach grass has been eliminated on RGDP, but the site should be monitored closely for its reintroduction. If this species is found, immediate action should be taken to remove it. Veldt grass and narrow leaf ice plant are invasive in scrub habitat on RGDP, but do not appear to be causing a significant loss of breeding habitat at this time. These species should be monitored on a yearly basis and action should be taken if they begin to spread. Pampas grass was discovered on RGDP in 2011 and was removed by Park staff. Continued use of the mini exclosure, though less desirable than a larger exclosure, remains the best alternative for especially vulnerable nests because of their lighter weight and the distances involved at RGDP.

Management Recommendations

Monitoring conducted since 2001 has shown that RGDP is an important breeding site for snowy plovers and has unrealized potential for least terns. Monitoring efforts have identified trends, important nesting areas, and a range of predators and other factors affecting nesting and fledging success. These data should be used to implement management plans that will protect and enhance least tern and snowy plover populations, while allowing continuing passive recreational use by the public.

RGDP provides important nesting habitat for snowy plovers and least terns, and also has the ability to direct management goals toward habitat improvements that may increase overall western snowy plover and California least tern populations. It has benefited from relatively light use in the past but the growing population on California's Central Coast is having an impact. A minimum of 34,846 vehicles, up 3600 from 2013, and 67,728 people in 2014, up 6850 from 2013 visited the Preserve in 2014. To increase productivity and reduce disturbance to plovers and terns on RGDP, we present the following recommendations:

1. *Visitor use* - To protect nesting plovers and terns, continue to install Sensitive Area signs and symbolic fence from March 1 through September 30 each year. Added measures to discourage trespass into protected areas should include continued park staff presence at the beach during all hours that RGDP is open to the public, with the staff's priority on preventing trespass, educating visitors; prevention of collection of natural objects and damage to dune vegetation. Appropriate signage prohibiting collection of natural materials would be beneficial. Interpretive signage on the sensitivity of dune wildlife would also help to make the public aware that the dunes are more than the vast expanse of sterile sand they might appear to be.

2. Trespass – Trespass into breeding habitat continues to put plovers and terns in danger. We recommend that the County continue using its citation authority to ticket visitors who knowingly enter breeding habitat. If the public knows citations will be issued, they will be less likely to enter the closed habitat.

3. Predators - Although some nest loss to predators is to be expected during any breeding season, predators can have a catastrophic influence on breeding success. Predator management strategies, including the use of mini nest exclosures or larger exclosures when needed, should be developed to reduce the incidence of excessive predation on the RGDP. Application by the County for a Federal depredation permit should make a difference in 2015.

Park staff should continue to practice good predator management activities such as daily removal of garbage from the beach area and parking lot, cleaning trashcans to prevent nesting mice, keeping the storeroom door closed to prevent mice entering. Additionally, staff help identifying potential predators and recording times and locations observed would provide valuable information for the monitor that could be incorporated into the annual Recovery Report.

4. Least terns - We recommend that when least terns nest on RGDP that they receive priority protection given their sensitive nature and endangered status. A long-term plan to increase least tern nesting on the site would be valuable. The plan should include: 1) tracking observations of least terns and their hunting areas each year by onsite staff, 2) diligence in protecting the colony from human disturbance, 4) protecting and improving habitat by a regular year-round schedule of invasive removal, 5) providing for long-term monitoring and predator control.

5. *Habitat enhancement* - Exotic invasive plant species are an ongoing problem at RGDP. Invasive plants reduce and degrade breeding habitat: iceplant, sea rocket and veldt grass threaten to overtake more suitable plover and tern nesting habitat each year. Park staff with the help of numerous volunteers recruited by the Dunes Center filled 752 30-gallon trash bags with ice plant and sea rocket from the fore dunes, and veldt grass from the roadsides. We recommend encouragement of more volunteers to help with invasive removal and a continued aggressive eradication program to eventually completely remove invasive species.

6. *Monitoring* - We recommend that RGDP continue to support ongoing quality monitoring that addresses population, nesting, predation, depredation, and hatching and fledging success, along with other issues such as impacts of public use that may affect snowy plover and least tern productivity. Successful management of the site will depend on the use of this information as a basis for sound short and long term management practices.

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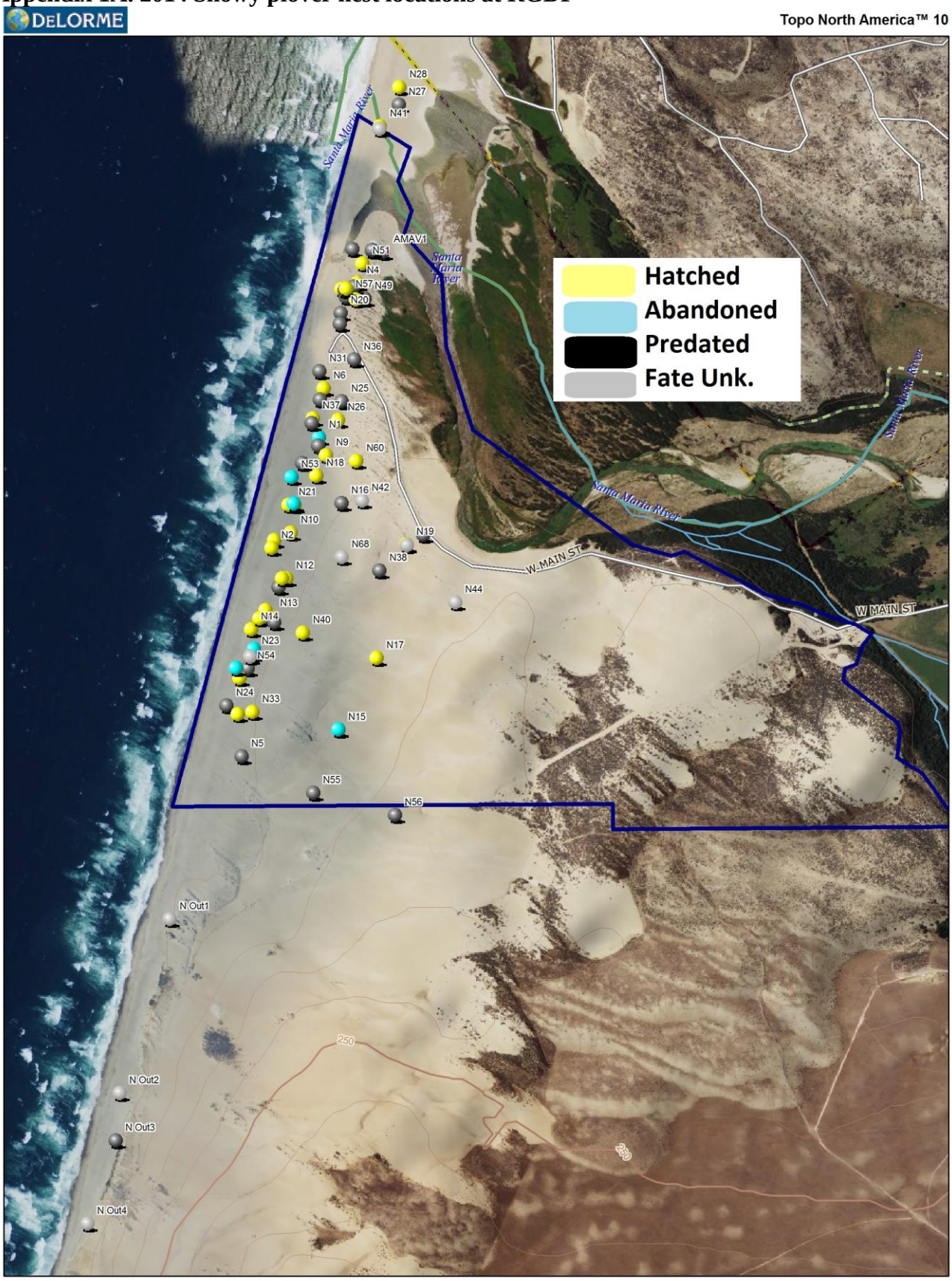
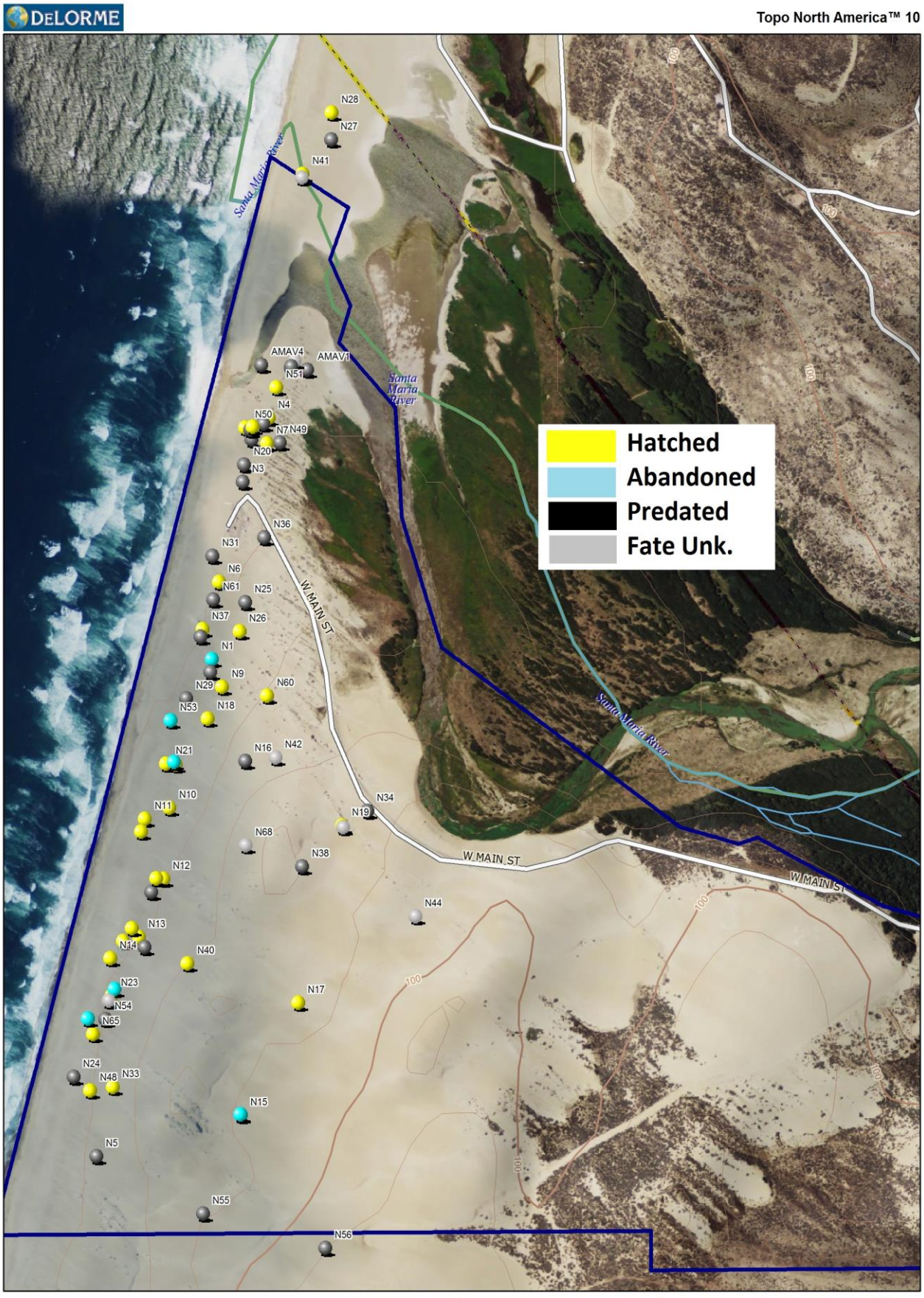
Appendix 1A. 2014 Snowy plover nest locations at RGDP



Appendix 1B. 2014 Snowy plover nest locations at RGDP & Mussel Rock beach.



Appendix 2. Other species or their sign observed on RGDP during 2014

American pipit (*Anthus rubescens*)
American yellow warbler (*Setophaga petechial*) formerly *Dendroica petechia*)
Barn swallow (*Hirundo rustica*)
Black-bellied plover (*Pluvialis squatarola*)
Black-crowned Night Heron
Black phoebe (*Sayornis nigricans*)
Blacktailed jack rabbit (*Lepus californicus*)
Blue-gray Gnatcatcher (*Polioptila caerulea)*
Botta's Pocket Gopher *(Thomomys bottae)*
Brewer's blackbird (*Euphagus cyanocephalus*)
California brown pelican *(Pelecanus occidentalis californicus)*
California legless lizard (*Anniella pulchra*)
Caspian tern (*Sterna caspia*)
Cattle Egret (*Bubulcus ibis)*
Coast horned lizard (*Phrynosoma coronatum*)
Cottontail rabbit (*Oryctolagus cuniculus*)
Deer Mice *(Peromyscus maniculatus)*
Elegant tern (*Sterna elegans*)
Eurasian Collared-dove (*Streptopelia decaocto)*
Feral pig *(Sus scrofa*)
Forester's tern (*Sterna forsteri*)
Fox Sparrow, Sooty ((*Passerella (iliaca) unalaschcensis*)
Great-tailed Grackle (*Quiscalus mexicanus)*
Golden-crowned Sparrow (*Zonotrichia atricapilla)*
Golden eagle (*Aquila chrysaetos*)
Great egret *(Ardea alba)*
Hermit Thrush *(Catharus guttatus)*
Horned lark (*Eremophila alpestris*)
House finch (*Carpodacus mexicanus*)
Lompoc Kangaroo rat (*Dipodomys heermani arenae*) Glenn Greenwald, pers. comm
Least sandpiper *(Calidris minutilla)*
Long-billed curlew (*Numenius americanus*)
Long-tailed weasel (*Mustela frenata*)
Mallard (*Anas platyrhynchos*)
Marbled godwit (*Limosa fedoa*)
Mountain lion (*Felis concolor)*
Mourning dove (*Zenaida macroura)*
Osprey (*Pandion haliaetus*)
Red-necked phalarope (*Phalaropus lobatus)*
Redwinged blackbird (*Agelaius phoeniceus*)
Royal tern (*Sterna maxima*)
Sanderling (*Calidris alba*)
Sea lion *(Zalophus califonianus)*
Semipalmated plover (*Charadrius semipalmatus*)
Snowy Egret (*Egretta thula)*
Southern mule deer (*Odocoileus hemionus fuliginatus*)
Spotted Towhee (*Pipilo maculatus)*
Swainson's Thrush (*Catharus ustulatus*)
Toad (*Bufo sp*.)
Turkey vulture (*Cathartes aura*)
Varied Thrush (*Ixoreus naevius)*
Western fence lizard (*Sceloporus occidentalis*)
Western meadowlark (*Sturnella neglecta*)
Western ring-necked snake (Diadophis punctatus amabilis)
Western sandpiper (*Calidris mauri*)
Wilson's Snipe (*Gallinago delicata*)
Wilson's Warbler (*Cardellina pusilla*)
Whimbrel (*Numenius phaeopus*)
White crowned sparrow (*Zonotrichia leucophrys*)
White tailed kite *(Elanus leucurus)*
Willet (*Catoptrophorus semipamatus*)
Wrentit (Chamaea fasciata